BEGONIA AUSTROTAIWANENSIS (BEGONIACEAE), A NEW SPECIES FROM SOUTHERN TAIWAN

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A new species of *Begonia, B. austrotaiwanensis* Chen & Peng from southern Taiwan, is described and illustrated. This species is usually found on moist, steep, rocky slopes at 200–800 m alt. Diagnostic features include an acaulescent, deciduous habit; moniliform rhizomes consisting of several ellipsoid to subglobose units with persistent stipules; inflorescences arising directly from the rhizome; flowers of both sexes scented, the staminate ones with four tepals, the pistillate ones with three tepals and two styles; two-locular ovaries; axile placentation; unequally three-winged capsules, with the abaxial wing narrowly triangular, erect, and much protruded; and a chromosome number of $n = 18$. The systematic position of *B. austrotaiwanensis* is in the Asiatic section *Platycentrum*.

During the past decade three new species of *Begonia* have been added to the flora of Taiwan (T. S. Liu & Lai, 1977; Y.-C. Liu & Ou, 1982; Peng *et al.*, 1988). Most recently, Ying (1988) proposed *Begonia fenchihuensis* as new; however, an examination of his original description and type specimens reveals that it is synonymous with *B. buimontana*, published about half a century ago by Yamamoto (1933). Nine species of *Begonia*, five of them endemic, are presently known from Taiwan. In our systematic revision of the Taiwanese species of *Begonia*, we discovered a distinct new species that brings the total to ten; it is described here.

Begonia austrotaiwanensis Y.-K. Chen & C.-I Peng, sp. nov. FIGURE 1.

Herba acaulis rhizomatibus reptantibus praedita, rhizomate aspectu grosse moniliforme, stipulis persistentibus triangularibus, 7–22 mm longis, 4–9 mm latis, induto. Folia oblique ovata, ad 38 cm longa, 32 cm lata. Inflorescentiae ad 55 cm longae, axillares ex rhizomate statim orientes. Flores omnes rosei, fragrantes. Flos ♂: tepala 4, decussata, duobus exterioribus rotundis ad orbiculares, 13–35 mm longis, 9–32 mm latis. Flos ♀: tepala 3, 2-seriatim disposita, duobus exterioribus oppositis, rotundis ad oblata, 16–32 mm longis, 7–23 mm latis, uno interiore oblanceolato ad obovato, 12–23 mm longo, 7–23 mm lato; styli 2. Fructus capsulares, inaequaliter alato, corpore ellipsoideo, ca. 15 mm longo, 7–8 mm in diametro, ala abaxiali recta, conspicue producta, anguste triangulari, 27–46 mm longa, 9–15 mm lata, alis lateralibus multo angustioribus, 9–14 mm longis, 2.3–3.5 mm latis. Numerus chromosomatum, $n = 18$.

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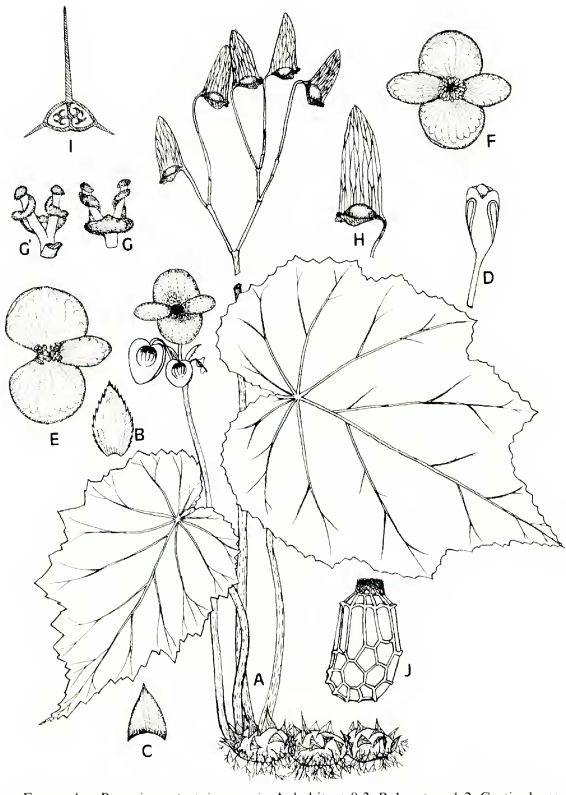


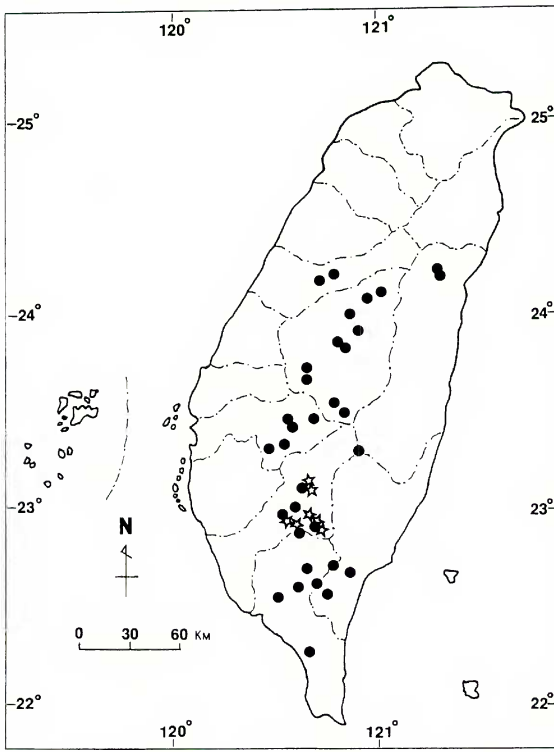
FIGURE 1. *Begonia austrotaiwanensis*: A, habit, × 0.3; B, bract, × 1.2; C, stipule, × 0.6; D, stamen, × 6; E, pistillate flower, × 0.6; F, staminate flower, × 0.6; G, G′, style, × 3; H, fruit, × 0.6; I, fruit, cross section, showing placentation, × 0.9; J, seed, × 60. (A–I from *Chen 100*, J from *Chen 522*.)

Perennial, deciduous, acaulescent herb with creeping rhizome; rhizome moniliform, consisting of several ellipsoid to subglobose units each 9–50 mm long, 7–25 mm in diameter, densely covered by persistent stipules, these triangular, 7–22 mm long, 4–9 mm wide, acuminate at apex. Leaves with petiole to 40 cm long, 9 mm in diameter, greenish or sometimes reddish; blade obliquely to broadly ovate, 13–38 by 10–32 cm, acuminate to cuspidate at apex, unequally cordate at base (often lobed in adult leaves), irregularly dentate-serrate, green, sometimes with white foveolate spots on upper surface and/or broad brown belts along adaxial veins, chartaceous to slightly succulent, venation palmate, the veins 6 to 10. Bracts caducous, in pairs, narrowly ovate to elliptic, 8–12 by 3.5–6.5 mm, acute at apex, serrate, pale green, papery to nearly succulent, glabrous. Inflorescences in androgynous dichasial cymes to 55 cm long arising directly from rhizome; peduncle erect, to 42 cm long, 8 mm in diameter. Flowers of both sexes pinkish, scented. Staminate flowers with tepals 4, decussate, spreading, margin sometimes reflexed, the outer 2 rotund to orbicular, 13–35 by 9–32 mm, the inner 2 oblanceolate to narrowly obovate, 10–32 by 6–18 mm; stamens 51 to 66, golf club shaped, yellow, the filaments free, 0.9–2.7 mm long, the anthers 1.8–2.3 mm long, 0.8–1.2 mm in diameter. Pistillate flowers with tepals 3 (very rarely 2 or 4, the fourth much reduced when present), the outer 2 opposite, rotund to oblate, 16–32 by 14–37 mm, the inner 1 oblanceolate to obovate, 12–23 by 7–23 mm; styles 2, Y-shaped, 4.2–5.3 mm long, yellow, the base separate to short-connate, 2.1–2.6 mm long, each arm covered with a spiral, papillose stigmatic band; ovary 2-locular, unequally 3-winged, obovoid, white to pale green, glabrous; placentae axile, bilamellate, the lamella forked. Infructescences to 72 cm long, the fruit-bearing pedicels 28–47 mm long; mature fruit a dry, trigonous, very unequally 3-winged capsule, the body ellipsoid, 9–15 mm long, 7–8 mm in diameter, the abaxial wing erect, much protruded, narrowly triangular, 27–46 by 9–15 mm, the lateral wings much narrower, 2.3–3.5 by 9–14 mm. Seeds numerous, narrowly ovoid, 0.39–0.43 mm long, 0.19–0.25 mm in diameter, rounded at apex, constricted at micropylar end, yellowish brown. Chromosome number, $n = 18$.

Distribution. Presently known only from Kaohsiung Hsien, Taiwan (see Map 1), 200–1000 m alt.

Type: Taiwan, Kaohsiung Hsien, Mawlin District, Shanping, 22°58′N, 120°41′E, elev. ca. 700 m, on moist, steep, rocky slope, *Y.-K. Chen 100* (living collection made on 27 July, 1987; type specimens pressed from cultivated plants in October 1988) (holotype, HAST; isotypes, GH, K, MO, NY, TAI, TAIF, US).

Additional specimens examined. **Taiwan.** Kaohsiung Hsien. Maolin Distr.: Shanping, 22°58′N, 120°41′E, elev. ca. 700 m, *Chen 522* (HAST), *Peng 10091* (HAST); Shanping logging trail, 22°58′N, 120°40′E, elev. ca. 600 m, *Chen 354* (HAST); Tona Hot Spring, 22°55′N, 120°42′E, elev. ca. 350 m, *Chen 638* (HAST); Tona logging trail, 22°54′N, 120°43′E, elev. ca. 750 m, *Chen & Peng 375* (HAST), 22°53′N, 120°44′E, elev. ca. 800 m, *Chen & Peng 381* (HAST); Tachin Waterfall, 22°52′N, 120°39′E, elev. ca. 300 m, *Chen 619* (HAST). Liukuei Distr.: Wangshanchiao, 22°55′N, 120°38′E, elev. ca. 200 m, *Chen 344* (HAST).



MAP 1. Distribution of *Begonia austrotaiwanensis* (stars) and *B. laciniata* (dots) in Taiwan.

HABITAT AND ASSOCIATED PLANTS. *Begonia austrotaiwanensis* often grows in moist, shallow soil on steep, rocky slopes and in somewhat shady habitats. The following species are commonly seen associated with it: *Alocasia macrorrhiza* (L.) Schott, *Arachnioides rhomboidea* (Wallich ex Mett.) Ching, *Asparagus cochinchinensis* (Lour.) Merr., *Aspidistra daibuensis* Hayata, *Aster taiwanensis*

Kitam., *Begonia laciniata* Roxb., *Carex baccans* Nees, *Colocasia formosana* Hayata, *Cyanotis kawakamii* Hayata, *Elatostema sessile* Forster var. *cuspidatum* Wedd., *Oplismenus undulatifolius* (Ard.) Roemer & Schultes, *Peperomia japonica* Makino, *Pilea kankaoensis* Hayata, *Pilea trinervea* Wight, *Pollia secundiflora* (Bl.) Bakh., *Selaginella delicatula* (Desv.) Alston, *Setaria palmifolia* (Koenig) Stapf, and *Tricyrtis formosana* Baker.

KEY TO THE SPECIES OF BEGONIA IN TAIWAN

The following key is provided to aid in the identification of the ten species of *Begonia* indigenous to Taiwan:

1. Plant acaulescent; inflorescences arising directly from rhizome.
   2. Tepals of pistillate flowers 3 (very rarely 2 or 4); rhizome moniliform; stipules persistent, plant deciduous. ..... *B. austrotaiwanensis.*
   2. Tepals of pistillate flowers 5; rhizome not moniliform; stipules deciduous; plant evergreen. ..... *B. fenicis.*
1. Plant caulescent; inflorescences arising from axils of cauline leaves.
   3. Tepals 2 in both staminate and pistillate flowers; tubers and stolons produced from the erect stem base; plant deciduous. ..... *B. ravenii.*
   3. Tepals 4 in staminate flowers, 5 to 6 (to 8) in pistillate flowers; tubers and stolons lacking; plant evergreen.
      4. Plant with distinct creeping rhizome.
         5. Plant densely pubescent throughout. ..... *B. laciniata.*
         5. Plant glabrous to subglabrous.
            6. Leaves irregularly finely dentate; abaxial wing on capsules rotund to orbicular, 19–26 mm long. ..... *B. chitoensis.*
            6. Leaves laciniate; abaxial wing on capsules nearly triangular, 7–16 mm long. ..... *B. formosana.*
      4. Plant without creeping rhizome.
         7. Plant densely pubescent. ..... *B. buimontana.*
         7. Plant glabrous to subglabrous.
            8. Capsules wingless. ..... *B. aptera.*
            8. Capsules unequally 3-winged.
               9. Mature leaves narrowly lanceolate to lanceolate, 7–14 by 2–4 cm, width/length quotient ca. 1/6–1/3; petiole 2–4 cm long. ..... *B. taiwaniana.*
               9. Mature leaves broadly lanceolate to narrowly ovate, 12–33 by 6–14 cm, width/length quotient ca. 2/5–3/5; petiole 6–26 cm long. ..... *B. lukuana.*

CYTOLOGY

Cytological studies of *Begonia austrotaiwanensis* (see FIGURE 2) reveal n = 18 or 19 in pollen mother cells and $2n$ = 36–38 in root-tip cells. Some interbivalent connections are observed in diakinesis, but the segregation of chromosomes at anaphase appears normal. Three small bivalents and either 15 or 16 larger ones are observed at diakinesis. This is corroborated by the somatic complement that consistently comprises six small chromosomes and 30 to 32 larger ones. It is possible therefore that the somatic chromosome number of *B. austrotaiwanensis* is $2n$ = 36, with the additional one or two large chromosomes observed in some cells being B-chromosomes. The B-chromosomes

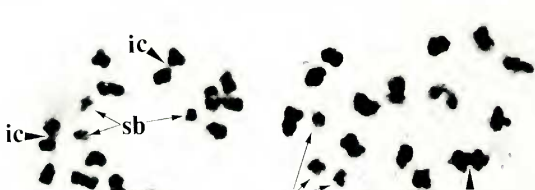


FIGURE 2. Chromosomes of *Begonia austrotaiwanensis* (from *Chen 375*): A, diakinesis, $n = 18$; B, diakinesis, $n = 19$, possibly 18 + 1B. Scale bar = 10 μm; sb = small bivalent; ic = interbivalent connection.

appear to be euchromatic and are not readily distinguishable from somatic chromosomes.

DISCUSSION

Begonia austrotaiwanensis is unique in having the combination of an acaulescent, deciduous habit; a moniliform rhizome consisting of several ellipsoid to subglobose units with persistent stipules; inflorescences arising directly from the rhizome; flowers of both sexes scented, the staminate flowers with four tepals, the pistillate ones with three tepals and two styles; two-locular ovaries; axile placentation; and very unequally three-winged capsules, with the abaxial wing narrowly triangular, erect, and much protruded. Plants of *B. austrotaiwanensis* usually grow on steep, bare, rocky slopes or rock faces with shallow soils, often near seasonal waterfalls or by streams. They are found at elevations between 200 and 800 m along the forest margin in southern Taiwan, an area with a monsoon climate. It is a very distinct species that is often sympatric with *B. laciniata* Roxb., which has a much wider distribution in Taiwan (see MAP 1). *Begonia laciniata* is usually found in the forest or at the forest margin at elevations between 600 and 2100 m. When the two species occur together, *B. austrotaiwanensis* tends to grow higher up on the rocky slopes, whereas *B. laciniata* is usually found at the base of the slope and is frequently intermixed with the abundant herbaceous vegetation.

An examination of *Begonia* specimens deposited at all herbaria in Taiwan reveals that *B. austrotaiwanensis* was not collected until 1986. It was overlooked in the past presumably due to its restricted distribution and because it often occurs together with the widespread *B. laciniata,* from which it is not readily distinguishable at a distance. Since *B. austrotaiwanensis* tends to grow higher up on steep rocky slopes that are relatively inaccessible, plant collectors are likely to ignore it and collect instead the abundant *B. laciniata* at their feet. The fact that *B. austrotaiwanensis* sheds its leaves in the winter also makes it less visible than the evergreen *B. laciniata.*

Traditionally, the number of tepals in staminate and pistillate flowers, the number of styles and ovarian locules, and the placentation type are important characters in delimiting the sections of *Begonia* (Baranov, 1981; Baranov & Barkley, 1974; Barkley, 1972a; De Candolle, 1864; Warburg, 1894). *Begonia austrotaiwanensis* appears to fit in section *Weilbachia* A. DC., which otherwise includes ten species from Mexico and two from Central America (one from El Salvador, one from Guatemala and El Salvador) (Baranov, 1981; Barkley, 1972b, 1972c; Barkley & Baranov, 1972; Barkley & Golding, 1974; Smith *et al.*, 1986; Warburg, 1894). Dieter C. Wasshausen (pers. comm.) suggested placing this new species in the Asiatic section *Platycentrum,* which characteristically has 4 to 6 tepals in the pistillate flowers (*B. austrotaiwanensis* usually has three, very rarely two or four, the fourth much reduced when present). Other than this character, which is evolutionarily labile (L. Brouillet, pers. comm.), *B. austrotaiwanensis* appears to be appropriately placed in sect. *Platycentrum.* Studies of leaf microcharacters of *Begonia* conducted in Brouillet's laboratory showed that sects. *Platycentrum* and *Weilbachia* differ in several traits related to indumentum and anatomy (Brouillet, pers. comm.). Section *Platycentrum* characteristically has leaf emergences with processes and pneumathodes (stomata in lines) on the petiole. By contrast, sect. *Weilbachia* lacks the above characters but has T-shaped glandular hairs and oxalacetic crystals in the leaves. In our study we found that *B. austrotaiwanensis* agrees perfectly in leaf microcharacters with sect. *Platycentrum* and may be appropriately placed in this Asiatic section.

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